Original Research Article

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Meteroglyph Analysis for Morphological Variation in Sunflower (*Helianthus annuus* L.)

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ABSTRACT

Keywords

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Sixty-one sunflower multihead inbred lines including one check were evaluated to study the morphological variations for eleven characters by Meteroglyph analysis and index score method. These lines were grouped into four complexes viz., 18 dwarf height with low seed yield per plant (Complex I), 17 tall height with low seed yield per plant (complex II), 15 dwarf height with high seed yield per plant (Complex III), 11 tall height with high seed yield per plant (Complex IV). The scatter diagram, index scoring and ray pattern showed that beside plant height and seed yield per plant, the genotypes SS-2038, IC-597575, EC-601785, EC-640337, IC-438395, EC-601938, TSG-90, TSG-36, TSG-97 showed higher morphological variations for more number of traits. Thus the use of these genotypes in future breeding programme is suggested.

Introduction

Sunflower (*Helianthus annuus* L.) is one of the most important oil seed crop in India. In India, was taken up in view of its various advantages viz., photo and thermo insensitivity, short duration, high yield and better quality of oil, high oleic acid (20%), linoleic acid (70%), palmitic acid (4.6%) and stearic acid (2.3%). Genetic variability is the basic requirement for crop improvement

as it provides wider scope for selection. The success of plant breeding for improving a trait of interest depends on the availability of diverse germplasm, precise selection procedure and crossing programme. There are several methods utilized for the assessment of genetic diversity and grouping of genotypes. Meteroglyph analysis initially given by Anderson (1957) was mainly for establishing relationship among races and biotypes of crop plants. Meteroglyph analysis has been used to access the genetic variability not only in

sunflower but also in several crop species across the genus. Dewan *et al.*, (1992) in Indian mustard; Chandra *et al.*, (1997) in turmeric; Laiju *et al.*, (2002) in *Hordeum* species; Ghafoor and Ahmad (2005) in black gram; Bhargava *et al.*, (2009) in *Chenopodium*; Khan *et al.*, (2007) in 7 cotton cultivars; Rashid *et al.*, (2007) in basmati rice mutants; Kang *et al.*, (2013) in sugarcane cultivar; Jha *et al.*, (2011) in chickpea and Datta *et al.*, (2013) in maize used this method to assess the morphological variations.

Thus, the present experiment was conducted with an aim to evaluate the morphological variation of 61 sunflower genotypes for eleven yield and yield component characters by Meteroglyph analysis and to develop a selection criterion.

Materials and Methods

The experimental material comprising 61 Multihead inbred lines of sunflower were grown during *khari* 2017 in a Randomized Block Design with two replications at the Experimental Farm, Oilseeds Research Station, Latur.

Data were recorded on three randomly tagged plants for days to 50% flowering, days to maturity, plant height (cm), head diameter (cm), number of branches per plant, seed filling (%), hull content (%), 100 seed weight (g), oil content (%), seed yield per plant (g), volume weight (g)/100 ml.

Data were subjected to the analysis of variance followed by Anderson's Meteroglyph technique to study the patterns of morphological variations in different genotypes.

All genotypes represented by open glyph. Two most variable characters, plant height and seed yield per plant were selected for X and Y axis, respectively. Except these traits other traits

were represented as rays on the glyph, where each glyph represented a genotype thus forming a scatter diagram.

Results and Discussion

The analysis of variance indicated significant variations among the sixty-one inbred lines for eleven characters. The scatter diagram revealed that four complexes could be distinguished on the basis of morphological variation (Fig.1 and Table 1). The Index scores and signs used for nine characters for Meteroglyph analysis were presented in Table 2.

Complex I was characterized dwarf height with low seed yield per plant this group comprised 18 lines. The Complex II was containing 17 lines and characterized by tall height with low seed yield per plant.

Dwarf height with high seed yield per plant was included in complex III. This complex comprised 15 lines. And fourth complex was characterized by tall height with high seed yield per plant which includes 11 lines.

The frequency diagram revealed that the index scores ranged from 15 to 27 (Fig. 2). Eleven genotypes recorded index score of 21 followed by 8, 7, 7, 7 genotypes with an index score of 23, 20, 25, 24 respectively. Minimum frequency of genotypes (1) occurred for index score of 15 and 17. Highest index score of 27 recorded by four lines.

The scatter diagram, index scoring and ray pattern showed that beside plant height and seed yield per plant, the genotypes, SS-2038, IC-597575, EC-601785, EC-640337, IC-438395, EC-601938, TSG-90, TSG-36, TSG-97 showed higher morphological variations for more number of traits. Thus, the use of these genotypes in future breeding programme is suggested.

Table.1 Complex constellation based on Meteroglyph analysis

Complex	Name of complex	No. of lines	Name of lines
I	Dwarf height with low seed yield per plant	18	EC-399490, EC-494380, EC-512738, EC-399621, EC-512711, EC-399512, EC-494356, EC-512685, EC-494399, EC-512693, EC-512678, TSG-71, TSG-107, EC-640350, EC-601744, EC-494427, EC-601612, TSG-84, EC-601875
II	Tall height with low seed yield per plant	17	IC-494364, IC-501988, EC-601935, TSG-19, EC-602064, EC-640358, EC-512724, TSG-07, TSG-36, EC-601988, EC-601890, EC-601932, EC-620191, EC-640337, EC-601938, IC-438395, TSG-108
III	Dwarf height with high seed yield per plant	15	EC-494389, EC-494396, EC-601676, EC-640327, EC-494380, EC-399622, EC-601655, EC-512758, EC-640332, TSG-37, EC-601759, EC-601846, EC-512709, EC-601760, EC-601765
IV	Tall height with high seed yield per plant	11	EC-601785, EC-601836, EC-601771, TSG-97, EC-601970, TSG-90, SS- 2038, IC-597575, EC-601885, EC-601974, EC-601906

Table.2 Index scores and signs used for nine characters under Meteroglyph analysis

character	Score 1	sign	Score 2	sign	Score 3	sign
	<i>Value <</i>		<i>Value from -to</i>		<i>Value ></i>	
Days to 50% flowering	54.55	○	54.55-59.6	◐	59.6	◑
Days to maturity	87.66	○	87.66-97.32	◐	97.32	◑
head diameter (cm)	14.1	○	14.1-20.3	◐	20.3	◑
No of branches per plant	2.038	○	2.038-4.06	◐	4.06	◑
Seed filling (%)	64.66	○	64.66-74.86	◐	74.86	◑
hull content (%)	27.05	○	27.05-35.1	◐	35.1	◑
100 seed weight (g)	3.78	○	3.78-4.98	◐	4.98	◑
oil content (%)	29.19	○	29.19-32.56	◐	32.56	◑
volume weight (g)	45.14	○	45.14-37.16	◐	55.18	◑

Fig.1 Scatter diagram of Meteroglyph analysis for 61 sunflower inbred lines.

Fig.2 Frequency diagram

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